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### (54) TELECOMMUNICATIONS LINE TEST SYSTEM

SYSTEM ZUR PRÜFUNG VON NACHRICHTENÜBERTRAGUNGSLEITUNGEN

SYSTEME DE VERIFICATION DE LIGNES DE TELECOMMUNICATIONS

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**AL 'AUTOMATED LINE TESTING FOR THE BT**  
**REPAIR SERVICE'**

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## Description

## FIELD OF THE INVENTION

[0001] This invention relates to the field of telecommunication testing and, in particular, to a portable telecommunications test system allowing for remote and simplified operation by a technician.

[0002] Existing dispatch, testing and conditioning systems for the telecommunications field, such as for telephone systems and the like, operate according to known methods and procedures. For example, when a subscriber or customer initiates a service call via a call to an automated repair service bureau, the administrator at the repair service bureau confirms the reported trouble and generates a trouble report or trouble ticket. Through the use of loop management operation systems, using flow through procedures, a technician, along with his vehicle, can be automatically dispatched to the proper location using a craft. access system (CAS) or a technician access network (TAN) in order to service the trouble report.

[0003] When this occurs, the dispatched technician is supplied with narratives indicating the type of trouble reported and detected, as well as customer information relative to the dispatch. The technician must be able to interpret the problem and identify the proper course of action in order to correct the trouble. In order to correct the trouble, the following steps are followed. Using CAS/TAN, the technician requests on-demand tests and conditions from a central office location. The central office location, via a line conditioning device, can then provide various test conditions over the telecommunications line to be tested, i.e., the "line under test". The technician must further coordinate the testing of the line with the proper portable test equipment or test head and ensure that correct test sequences are issued for the test head.

[0004] In the field of telecommunications testing, it has heretofore been known to provide an expensive and complicated test head for physically coupling with the line under test. The technician physically connects the known test head to the telecommunications line. These known test heads include various electronic circuits for coupling with the line under test, as well as a computer hard-wired thereto. The computer allows the technician to perform various tests on the line.

[0005] It is a major disadvantage of these known systems that the technician must conduct the tests on the line at the location, where the test head couples to the line. In view of the test head being physically connected with a line at oftentimes difficult or barely accessible locations, the technician incurs added labor time in trying to conduct the tests via the hard wired computer. Further, the technician is physically limited by the placement of the test head such that increased stress results due to the awkward postures which must be maintained.

[0006] Not only is it difficult for the technician to use the known test heads, the technician is also required to

have a substantial knowledge of ever-changing subscriber loop and other support systems.

[0007] Another disadvantage with the known methods and procedures is that inadequately trained technicians may not be able to solve a customer's trouble in the allotted time frame.

[0008] Therefore a user friendly portable telecommunications test is needed and trouble shooting expert system which overcomes the above disadvantages. The trouble shooting expert system must efficiently address the customer's troubles.

[0009] A telecommunication test system corresponding to the preamble of claim 1 is known e.g. from patent document FR-A-2 547 140. Document JP-A-3 108 933 discloses a remote controller for an exchange in which test signals are detected through a wireless link.

[0010] The present invention includes a telecommunication test system for a line to be tested, as set forth in claim 1, comprising : a test measurement device for coupling with said line, said test measurement device determining parameter data from said line; a processor for receiving said parameter data; and a first communication path between said device and said processor for transmitting said parameter data, said first communication path being a wireless path.

[0011] The invention also relates to a corresponding method as set forth in claim 17.

[0012] The present invention meets these needs by providing a portable telecommunications test system using a generic test head for coupling to a line under test as well as a non-integrated hand-held personal computer in communication with the test head. The hand-held personal computer communicates with the generic test head in a wireless fashion. This allows the technician to have increased mobility at the customer test site. Further, by incorporating the intelligence of the test head in the hand-held personal computer, a low cost, portable test measurement device, i.e., the test head, can be used. Thus, it is also possible in preferred embodiments to permanently install the test head at a customer site such that it can be operated via a remote site using the hand-held personal computer.

[0013] The present invention also provides for a user friendly, dispatch, test and trouble shooting expert system operable via the hand-held personal computer. This allows for complete and expedient testing of the customer site than was previously possible via a lower skilled technician. The application software operable on the hand-held personal computer provides the technician with an easy, step by step, procedure to perform various tests on the line.

[0014] The application software further allows the technician's hand-held personal computer to interact with all types of existing operational support systems as well as providing a platform for future information exchanges. The application software provides an icon-based, user friendly graphics interface for the technician using the hand-held personal computer.

[0015] The invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a schematic block diagram representation of a wireless portable telecommunications testing system;

Figure 2 is a schematic block diagram of a preferred embodiment of a portable telecommunications testing system; and

Figures 3-15 are screen representations indicating the data flow in accordance with the application software.

[0016] Figure 1 illustrates a portable telecommunications test system having a portable, remote test measurement device 10, i.e., a test head, is provided. The test head 10 can be coupled to a line under test such as a fiber optic line 12 or twisted copper tip/ring and ground conductors 14. The test head 10 determines various parameter measurements on the line under test 12, 14. The parameter measurements from the test head 10 are communicated to a portable personal computer 16. The personal computer 16, in a preferred embodiment, can be a handheld personal computer such as the Newton<sup>TM</sup> manufactured by Apple Corporation. The personal computer 16 communicates with the test head 10 via a wireless signal 18. For example, the wireless signal 18 can be of a spread spectrum or infrared type of transmission signal.

[0017] The hand-held personal computer 16 receives the raw measured data from the test head 10 and operates on the data to convert the measurement results into usable parameter information. This usable parameter information is then transmitted, also via a wireless signal 20, to a line conditioning device 22 or an automated test equipment device 24 located in a central office 26. As shown in Figure 1, the wireless transmission can be, for example, an analog cellular transmission via a cell 21 or a digital personal communications transmission (not shown). In a preferred embodiment as will be described with respect to Figure 2, wireless communications can also be made with a data center for access to outside support systems.

[0018] In the central office 26, the line conditioning device 22, 10 which receives the information and directions from the hand-held personal computer 16 via DTMF commands, responds to the hand-held personal computer 16 with synthesized voice through a voice responsive system by dialing the telephone circuit or line under test 12, 14. It is also possible to use a modem 27 by which the line conditioning device 22 the information and directions from the hand-held personal computer 16. The line conditioning device 22 then places different test conditions onto the line under test 12, 14 such as, for example, opens, shorts, tones, quiet terminations, etc. The line conditioning device 22 operates at the direction of the hand-held personal computer 16. One

example of a line conditioning device is the direct access test unit (DATU) product manufactured by Harris Corporation and disclosed in the specifications of U.S. Patent No.'s 4,670,898 and 4,841,560.

[0019] A low cost, generic test head 10 can include a number of plug-in cards for coupling with various lines to be tested. For example, the following plug-in cards can be used in the test head 10: an analog telephone circuit card 30; an analog PL/SS card 32; a digital card 34 for coupling with high speed digital circuits such as T1, E1, fractional T1, etc.; a fiber optic card 36 for coupling with a fiber optic line such as line 12 in Figure 1; an ISDN "U" interface card 38 for coupling with an ISDN line; a community access TV (CATV) card 40 for coupling with a CATV transmission; and an optical loop carrier/digital loop carrier card 42. In alternative embodiments, the plug-in cards 30-42 can take the form of software or hardware added to the hand-held PC 16 or the test head 10.

[0020] Figure 1, shows a voice activated, wireless headset 44 can be used by the technician for wireless communications with the hand-held PC 16. The wireless headset 44 can be used with the hand-held PC 16 and test head 10 to run automated tests via the voice response system, with an audio go/no-go indication of the test results being provided to the technician.

[0021] In the even. of a customer service request, the portable telecommunications test system of the present invention is operated as follows. A technician dispatched to the test site physically couples the test head 10 to the line under test, such as fiber optic line 12 or twisted copper lines 14. As noted above, the test head 10 can connect to various transmission media via the use of specific plug-in cards. Through the use of the plug-in cards 30-42, the test head 10 can be used to test regular telephones or special service analog/digital telephone circuits, high-speed digital circuits such as T1, E1, fractional T1 and the like, video circuits such as CATV, ADSL, HDSL, video dial-tone, etc.

[0022] Once the test head 10 is coupled to the line under test, the technician uses the hand-held PC 16 to establish communications with the test head 10 via a wireless signal such as a spread spectrum or infrared type link. The hand-held PC 16 then communicates with the central office's line conditioning device 22 via a wireless transmission such as an analog cellular telephone or digital personal computer system. The hand-held PC 16 can then be used to direct the line conditioning device 22 to place different test conditions onto the line under test. These test conditions can be, for example, shorts, opens, quiet terminations, tones, etc.

[0023] The test head 10 then measures the different conditions placed on the line under test via the hand-held personal computer 16. The results from the test head 10 are wirelessly transmitted to the hand-held personal computer 16.

[0024] The hand-held personal computer 16 then takes the raw data transmitted from the test head 10 and

processes the data into usable information. Based upon the results of the processed information, the hand-held PC 16 can direct the line conditioning device 22 to place different conditions onto the line under test. This cycle continues until the line has been completely tested.

[0025] Figure 2 shows an embodiment 25 of a portable telecommunications test system. A test head 10 is coupled with a line under test 13 from a central office 26. The test head 10 communicates with a hand-held personal computer 16. The test head 10 performs all data acquisition on demand from the personal computer 16. This includes functional tests such as capacitive and resistive fault location, noise tests, loss, transmission, TDR, etc. The test head 10 and hand-held personal computer 16, as noted above with respect to Figure 1, are expandable through the use of plug-in cards and software programs for coupling with various lines such as fiber optic lines and coaxial cables.

[0026] The hand-held personal computer 16 communicates with a technician's vehicle 50 which can forward the directions from the personal computer 16 to the central office 26 or to a data center 61. These communications can occur in a wireless fashion 59 as was discussed above with respect to Figure 1, or via a back-up wired line 69 (shown in a dashed manner) depending upon the situation.

[0027] Inside the technician's vehicle 50, there is located charge holder 52, printer 54, a long haul wireless interface 56 and a network server 58. The charge holder 52 operates to provide power for the test system. The printer 54 is available to print out various test results or other information. The interface 56 provides a short-haul wireless gateway to long haul wireless services, i.e., from spread spectrum transmissions to RAMS, ARDIS, COPD, cellular, CDMA, etc. The network server 58 provides additional processing power and electronic storage. The server 58 can also perform on demand from the hand-held PC 16 storage and batch mode requests for network schematics.

[0028] Within the central office 26, there is located the central office switch 53, central office test devices 55, and a line conditioning device such as the DATU line conditioning device 57 produced by Harris-Corporation.

[0029] The central office test devices 55 can provide an interface with various operational support systems such as a vehicle dispatch 58, outside plant record database 60, automated testing systems 62 such as MLT, ALIT, SASS, etc., and electronic network schematics 64. These other support systems form the data center 61. For example, the SASS system provides a telephone ring back apparatus for use by the technician. The SASS system is disclosed in the specification of U.S. Patent No. 4,764,949.

[0030] The portable telecommunications test system essentially is a local area network wherein the personal computer 16 is the client and the elements within the technician's van 50 and the portable test gear 10 are the servers.

[0031] The personal computer 16 provides a user friendly interface to the technician through the use of icons. The personal computer 16 is responsible for communications, information management and test sequence orchestration for the test system. With respect to the communications, in a preferred embodiment, the personal computer 16 uses short haul wireless signals in order to communicate with the portable test head 10 and the technician van 50. A wireline back-up modem can also be provided. The personal computer 16 can interface with other support systems such as the outside plant record database, the automated testing systems, the electronic network schematics, as well as the DATU product discussed above.

[0032] In accordance with the application software, the personal computer 16 fully integrates the dispatch system information to automate subsequent requests to the other support systems for information and testing. The application software further extends the information integration to allow automated trouble shooting based on dispatch and reactional testing. The personal computer 16 also orchestrates the test sequence for the line under test 13. The operation of the personal computer 16 through the use 10 of the application software will be described below with reference to Figures 3-15, wherein the data flow is discussed with reference to the user friendly graphic screens of the personal computer 16. A complete copy of the application software, in a source code format, is attached as a microfiche appendix.

[0033] With reference to Figure 3, once the technician has coupled the test head 10 to the line under test, the application software operating on the hand-held personal computer 16 queries the technician to select a function for evaluating the telecommunications line. These functions include, for example, a work order manager 60, DATU 62, MLT 64, meter 66, display time sheet 68, and a configuration function 70. The application software provides for the use of easily selectable icons 62-70 for the technician to select the appropriate function.

[0034] If the technician selects the work order manager 60, then, referring to Figure 4, the application software provides a user friendly interface to the technician in order that the technician may choose to: get a work order 72, process a work order 74, close a work order 76, or perform a mail function 78.

[0035] Referring to Figure 5, there is shown the application software display for a work order selected in accordance with r Figure 4. The work order referred to in Figure 5 allows the technician to select from among various pieces of information such as customer information, trouble reports, previous trouble history, etc. If the technician desires the customer information, for example, then the application software provides such information as shown in the display of Figure 6. Similarly, Figure 7 displays the trouble report information if selected by the technician. Figures 8 and 9 display the previous trouble history and the commitment/dispatch data

and time selections. As can be seen from the above, the application software provides an easy and user friendly data flow for the technician in order to service the trouble report of the customer using the personal hand-held computer 16.

[0036] Referring back to Figure 3, if the technician selects another support system such as DATU, then the application software operating on the personal computer 16 provides the technician with DATU line conditions as shown in Figure 10. The application software fully integrates the DATU functions with any trouble report information, for example, phone number and translation into DATU phone number. As shown in Figure 10, the technician need only select the proper DATU function such as ring ground, tip ground, tip-ring short-to-ground, full level tone, open line, etc. The application software on the personal handheld computer 16 instructs the DATU system to perform the necessary tests transparent to the technician.

[0037] Again referring back to Figure 3, if the technician selects the mechanized loop test (MLT) function, then the application software operates to display the test options as shown in Figure. These options include a full test, quick test with drop, and a loop test with drop. The application software operates to integrate the trouble report information with the selected test requests in accordance with Figure 11. For example, if the full test is selected, then the application software operates to prompt the technician to select either the craft results, i.e., the vehicle results, or the mechanized loop test results as shown in Figure 12. If the craft results are selected, then the application software displays the results as shown, for example, in Figure 13. Alternatively, the MLT results are shown in Figure 14 for example. Again referring back to Figure 3, if the display time sheet function 68 is selected, then the application software operates to display the time sheet as shown in Figure 15. The time sheet automatically functions to collect the data from the trouble report orders.

[0038] As can be seen by the above examples, the application software provides a user friendly graphics interface allowing the technician to perform all sorts of testing and diagnostic functions on the line under test. This allows the telecommunication companies to use a lower skilled work force without the need for extensive training. The personal hand-held computer 16 is capable of receiving and interpreting dispatch information into a set of automated sequences that can solve a trouble report in the most economical manner possible.

[0039] The personal hand-held computer 16 also allows the technician's vehicle to interact with all existing operational support systems as well as providing a platform for future information exchange.

## Claims

1. A test system for a telecommunications line to be

tested, comprising:

- a test measurement device (10) for coupling with said line (12; 14; 13) to be tested, said test measurement device determining parameter measurement data from said line;
- a processor (16) for receiving said parameter measurement data; and
- a first communication path (18) between said test measurement device and said processor for transmitting said parameter measurement data;

characterized in that said processor is a hand-held processor (16), and said first communication path (18) is a wireless path; and in that said test system further comprises:

- a second, wireless, communication path (20, 21; 59) between said hand-held processor (16) and a central office (26),

wherein said hand-held processor is operative to process said parameter measurement data into usable parameter information and transmit the latter to said central office via said second communication path, and wherein said central office is responsive to said usable parameter information to place various test signals on the line under test (12, 14; 13).

2. The system of claim 1, wherein said first communication path (18) is a spread spectrum transmission path.
3. The system of claim 1, wherein said first communication path (18) is an infrared type of transmission.
4. The system of any one of claims 1 to 3, wherein said second communication path (20, 21; 59) is an analog transmission path.
5. The system of any one of claims 1 to 3, wherein said second communication path (20, 21; 59) is a digital personal communication system communication path.
6. The system of any one of claims 1 to 5, wherein said central office (26) comprises a line conditioning device (22) for dialing said line under test (12, 14; 13) and placing said various signals on said line.
7. The system of claim 6, wherein said conditioning device (22) comprises a direct access test unit DATU.
8. The system of any one of claims 1 to 7, further comprising a voice-activated headset (44) wirelessly connected to said hand-held processor (16).

9. The system of any one of claims 1 to 8, further comprising a mobile facility (50) comprising means (56) for communicating with said hand-held processor (16) via said second communication path (59), and a third communication path (59) between said mobile facility and said central office (26). 5
10. The system of claim 9, further comprising a data test center (61) arranged for communicating with said mobile facility (50). 10
11. The system of claim 9 or 10, wherein said third communication path includes a primary wireless path (59) and a wireline back-up path (69), the latter being established between said mobile facility (50) and said central office (26). 15
12. The system of any one of claims 9 to 11, configured to pass said usable parameter information from said hand-held processor (16) to said central office (26) via said mobile facility (50). 20
13. The system of any one of claims 10 to 12, configured to pass said usable parameter information from said hand-held processor (16) to said test center (61) via said mobile facility (50). 25
14. The system of any one of claims 11 to 13, wherein said primary path of said third communication path (59) is a spread spectrum transmission path. 30
15. The system of any one of claims 11 to 13, wherein said primary path of said third communication path (59) is an infrared transmission path. 35
16. The system of any one of claims 9 to 15, wherein said mobile facility (50) includes: 40
- a network server (58) providing additional processing power for said hand-held processor (16);
  - an interface (56) providing a short-haul wireless gateway to long-haul wireless services;
  - a charge holder (52); and
  - a printer (54). 45
17. A method of testing a telecommunications line, comprising the steps of: 50
- coupling the line to be tested (12, 14; 13) to a test measurement device (10), and using a test measurement device to determine parameter measurement data from said line;
  - receiving said parameter measurement data on a processor (16); and 55
  - establishing a first communication path (18) between said test measurement device and said processor for transmitting said parameter

measurement data;

characterized in that said processor is a hand-held processor (16), and said first communication path (18) is a wireless path; and in that said method further comprises the steps of:

- establishing a second, wireless, communication path (20, 21; 59) between said hand-held processor (16) and a central office (26);
- using said hand-held processor to process said parameter measurement data into usable parameter information and to transmit the latter to said central office via said second communication path; and
- placing, from said central office, various test signals on the line under test (12, 14; 13) in response to said usable parameter information.

18. The method of claim 17, further comprising the step of providing a mobile facility (50) through which said hand-held processor (16) communicates with said central station (26); there being provided means (56) at said mobile facility for communicating with said hand-held processor (16) via said second communication path (59), and a third communication path (59) between said mobile facility and said central office (26).

#### Patentansprüche

1. Testsystem für zu überprüfende Telekommunikationsleitungen mit
- einer Testmeßvorrichtung (10) zum Ankoppeln an die zu überprüfenden Leitungen (12; 14; 13), wobei die Testmeßvorrichtung Parameter-Meßdaten der Leitung feststellt;
  - einem Prozessor (16) zum Empfang der Parameter-Meßdaten; und
  - einer ersten Übertragungsstrecke (18) zwischen der Testmeßvorrichtung und dem Prozessor zur Übertragung der Parameter-Meßdaten,

dadurch gekennzeichnet,

daß der Prozessor ein Hand-Held-Prozessor (16) und die Übertragungsstrecke (18) drahtlos ist; und  
daß die Testvorrichtung ferner enthält:

- eine zweite drahtlose Übertragungsstrecke (20, 21; 59) zwischen dem Hand-Held-Prozessor (16) und einem Zentralbüro (26), wobei der Hand-Held-Prozessor die Parameter-Meßda-

ten in brauchbare Parameterdaten umarbeitet und letztere über die zweite Übertragungsstrecke zum Zentralbüro überträgt, das auf die brauchbaren Parameterdaten entsprechend verschiedene Testsignale auf die zu überprüfende Leitung (12; 14; 13) gibt.

2. Testsystem nach Anspruch 1, bei welchem die erste Übertragungsstrecke (18) eine Bandspreiz-Übertragungsstrecke ist.
3. Testsystem nach Anspruch 1, bei welchem die erste Übertragungsstrecke (18) eine Infrarot-Übertragungsstrecke ist.
4. Testsystem nach einem der Ansprüche 1 bis 3, bei welchem die zweite Übertragungsstrecke (20, 21; 59) eine analoge Übertragungsstrecke ist.
5. Testsystem nach einem der Ansprüche 1 bis 3, bei welchem die zweite Übertragungsstrecke (20, 21; 59) eine Übertragungsstrecke eines digitalen persönlichen Übertragungssystem ist.
6. Testsystem nach einem der Ansprüche 1 bis 5, bei welchem das Zentralbüro (26) mit einer Leitungskonditioniervorrichtung (22) zum Anwählen der zu überprüfenden Leitung (12; 14; 13) und zum Anlegen verschiedener Signale an die Leitung versehen ist.
7. Testsystem nach Anspruch 6, wobei die Leitungskonditioniervorrichtung eine Direktzugangstestseinheit DATU ist.
8. Testsystem nach einem der Ansprüche 1 bis 7, welches eine durch die Stimme aktivierbare Prüf-Kopfgamitur (44) enthält, die drahtlos mit dem Hand-Held-Prozessor (16) verbunden ist.
9. Testsystem nach einem der Ansprüche 1 bis 8, welches ferner ein Fahrzeug (50) zur Kommunikation mit dem Hand-Held-Prozessor (16) über die zweite Übertragungsstrecke (59) und zwischen dem Fahrzeug und dem Zentralbüro (26) über eine dritte Übertragungsstrecke (59) enthält.
10. Testsystem nach Anspruch 9, welches ein Datenprüfzentrum (61) für die Kommunikation mit dem Fahrzeug (50) umfaßt.
11. Testsystem nach Anspruch 9 oder 10, bei welchem die dritte Übertragungsstrecke einen drahtlosen Primärweg (59) und einen drahtlosen Sicherungsweg (69) zwischen dem Fahrzeug (50) und dem Zentralbüro (26) umfaßt.
12. Testsystem nach einem der Ansprüche 9 bis 11, bei

welchem die brauchbaren Parameterinformationen vom Hand-Held-Prozessor (16) zum Zentralbüro (26) über das Fahrzeug (50) übertragbar sind.

- 5 13. Testsystem nach einem der Ansprüche 10 bis 12, bei welchem die brauchbaren Parameterinformationen vom Hand-Held-Prozessor (16) zum Zentralbüro (26) über das Fahrzeug (50) übertragbar sind.
- 10 14. Testsystem nach einem der Ansprüche 11 bis 13, bei welchem der primäre Übertragungsweg der dritten Übertragungsstrecke (59) eine Bandspreiz-Übertragungsstrecke ist.
- 15 15. Testsystem nach einem der Ansprüche 11 bis 13, bei welchem der primäre Übertragungsweg der dritten Übertragungsstrecke (59) eine Infrarot-Übertragungsstrecke ist.
- 20 16. Testsystem nach einem der Ansprüche 9 bis 15, bei welchem das Fahrzeug (50) enthält:
  - einen Netzwerkservers (58), um für den Hand-Held-Prozessor (16) zusätzliche Verarbeitungsleistung vorzuhalten,
  - eine Schnittstelle (56) für einen Nahverkehrs- und einen Fernverkehrsservice,
  - einen Ladungshalter (52) und
  - einen Drucker (54).
- 30 17. Verfahren zum Testen von Telekommunikationsleitungen mit den Verfahrensschritten:
  - 35 - Ankoppeln der zu überprüfenden Leitung (12; 14; 13) an eine Testmeßvorrichtung (10) und Verwenden der Testmeßvorrichtung zum Bestimmen der Parameter-Meßdaten für die Leitung,
  - Empfangen der Parameter-Meßdatei in einem Prozessor (16) und
  - 40 - Aufbauen einer ersten Übertragungsstrecke (18) zwischen der Testmeßvorrichtung und dem Prozessor zur Übertragung der Parameter-Meßdaten; gekennzeichnet durch einen Hand-Held-Prozessor (16) und einen drahtlosen ersten Übertragungsweg sowie die nachfolgenden Verfahrensschritte:
    - 45 - Aufbauen einer zweiten drahtlosen Übertragungsstrecke (20, 21; 59) zwischen dem Hand-Held-Prozessor (16) und dem Zentralbüro (26),
    - 50 - Verwenden des Hand-Held-Prozessors, um die Parameter-Meßdaten in eine brauchbare Parameterinformation umzuwandeln, und diese zum Zentralbüro über den zweiten Übertragungsweg zu übertragen,
    - Einspeisen verschiedener Testsignale auf die zu überprüfende Leitung (12; 14; 13) vom Zen-



tralbüro aus als Antwort auf die brauchbaren Parameterdaten.

18. Verfahren nach Anspruch 17, gekennzeichnet durch die Bereitstellung eines Fahrzeugs (50), über welches der Hand-Held-Prozessor (16) mit dem Zentralbüro (26) kommuniziert, wobei Mittel (56) am Fahrzeug für den Verkehr zwischen Hand-Held-Prozessor (16) und dem Fahrzeug über die zweite Übertragungsstrecke (59) sowie zwischen dem Fahrzeug und dem Zentralbüro (26) über eine dritte Übertragungsstrecke (59) bereitgestellt werden.

#### Revendications

1. Système de vérification pour une ligne de télécommunications à vérifier, comprenant :

- un dispositif de mesure de vérification (10) pour le couplage à ladite ligne (12, 14; 13) à vérifier, ledit dispositif de mesure de vérification déterminant des données de mesure de paramètres à partir de ladite ligne ;
- un processeur (16) pour recevoir lesdites données de mesure de paramètres ; et
- un premier chemin de communication (18) entre ledit dispositif de mesure de vérification et ledit processeur pour transmettre lesdites données de mesure de paramètres ;

caractérisé en ce que ledit processeur est un ordinateur portable (16), et en ce que ledit premier chemin de communication (18) est un chemin sans fil ;

et en ce que ledit système de vérification comprend également :

- un deuxième chemin de communication sans fil (20, 21 ; 59) entre ledit processeur portable (16) et un bureau central (26),

où ledit processeur portable est opérationnel pour traiter lesdites données de mesure de paramètres pour en faire une information de paramètres utilisable et transmettre cette dernière audit bureau central via ledit deuxième chemin de communication, et où ledit bureau central réagit à ladite information de paramètres utilisable pour placer divers signaux de vérification sur la ligne soumise à vérification (12, 14; 13).

2. Système selon la revendication 1, où ledit premier chemin de communication (18) est un chemin de transmission à étalement du spectre.
3. Système selon la revendication 1, où ledit premier

chemin de communication (18) est un type de transmission infrarouge.

4. Système selon l'une quelconque des revendications 1 à 3, où ledit deuxième chemin de communication (20, 21 ; 59) est un chemin de transmission analogique.

5. Système selon l'une quelconque des revendications 1 à 3, où ledit deuxième chemin de communication (20, 21 ; 59) est un chemin de communication pour système de communication personnel numérique.

6. Système selon l'une quelconque des revendications 1 à 5, où ledit bureau central (26) comprend un dispositif de conditionnement de ligne (22) pour appeler la ligne soumise à vérification (12, 14 ; 13) et placer lesdits divers signaux sur ladite ligne.

7. Système selon la revendication 6, où ledit dispositif de conditionnement (22) comprend une unité de vérification d'accès direct DATU.

8. Système selon l'une quelconque des revendications 1 à 7, comprenant également un casque d'écoute activé à la voix (44) connecté sans fil audit processeur portable (16).

9. Système selon l'une quelconque des revendications 1 à 8, comprenant également un équipement mobile (50) comprenant des moyens (56) pour communiquer avec ledit processeur portable (16) via ledit deuxième chemin de communication (59), et un troisième chemin de communication (59) entre ledit équipement mobile et ledit bureau central (26).

10. Système selon la revendication 9, comprenant également un centre de vérification de données (61) agencé pour communiquer avec ledit équipement mobile (50).

11. Système selon la revendication 9 ou 10, où ledit troisième chemin de communication comprend un chemin sans fil primaire (59) et un chemin de secours câblé (69), ce dernier étant établi entre l'équipement mobile (50) et ledit bureau central (26).

12. Système selon l'une quelconque des revendications 9 à 11, configuré pour faire passer ladite information de paramètres utilisable depuis le processeur portable (16) vers ledit bureau central (26) via ledit équipement mobile (50).

13. Système selon l'une quelconque des revendications 10 à 12, configuré pour faire passer ladite information de paramètres utilisable depuis le processeur portable (16) vers ledit centre de vérifica-



tion (61) via ledit équipement mobile (50).

14. Système selon l'une quelconque des revendications 11 à 13, où ledit chemin primaire dudit troisième chemin de communication (59) est un chemin de transmission à étalement du spectre. 5

15. Système selon l'une quelconque des revendications 11 à 13, où ledit chemin primaire dudit troisième chemin de communication (59) est un chemin de transmission infrarouge. 10

16. Système selon l'une quelconque des revendications 9 à 15, où ledit équipement mobile (50) comprend : 15

- un serveur de réseau (58) fournissant une énergie supplémentaire de traitement pour ledit processeur portable (16) ;
- une interface (56) fournissant une passerelle sans fil courte distance vers des services sans fil grande distance : 20
- un support de charge (52) ; et
- une imprimante (54). 25

17. Procédé de vérification d'une ligne de télécommunications, comprenant les étapes suivantes :

- couplage de la ligne à vérifier (12, 14 ; 13) à un dispositif de mesure de vérification (10), et utilisation d'un dispositif de mesure de vérification pour déterminer des données de mesure de paramètres à partir de ladite ligne ; 30
- réception desdites données de mesure de paramètres sur un processeur (16); et 35
- établissement d'un premier chemin de communication (18) entre ledit dispositif de mesure de vérification et ledit processeur pour transmettre lesdites données de mesure de paramètres ; 40

caractérisée en ce que ledit processeur est un processeur portable (16), et ledit premier chemin de communication (18) est un chemin sans fil ;

et en ce que ladite méthode comprend en outre les étapes suivantes : 45

- établissement un deuxième chemin de communication sans fil (20, 21 ; 59) entre ledit processeur portable (16) et un bureau central (26) ; 50
- utilisation dudit processeur portable pour traiter lesdites données de mesure de paramètres pour en faire une information de paramètres utilisable et pour transmettre cette dernière à un bureau central via ledit deuxième chemin de communication ; et 55
- placement, à partir du bureau central, de divers signaux de vérification sur la ligne soumise à

vérification (12, 14 ; 13) en réponse à ladite information de paramètres utilisable.

18. Procédé selon la revendication 17, comprenant en outre l'étape consistant à réaliser un équipement mobile (50) par le biais duquel ledit processeur portable (16) communique avec ladite station centrale (26), des moyens (56) étant prévus dans ledit équipement mobile pour communiquer avec ledit processeur portable (16) via ledit deuxième chemin de communication (59), et un troisième chemin de communication (59) entre ledit équipement mobile et ledit bureau central (26).

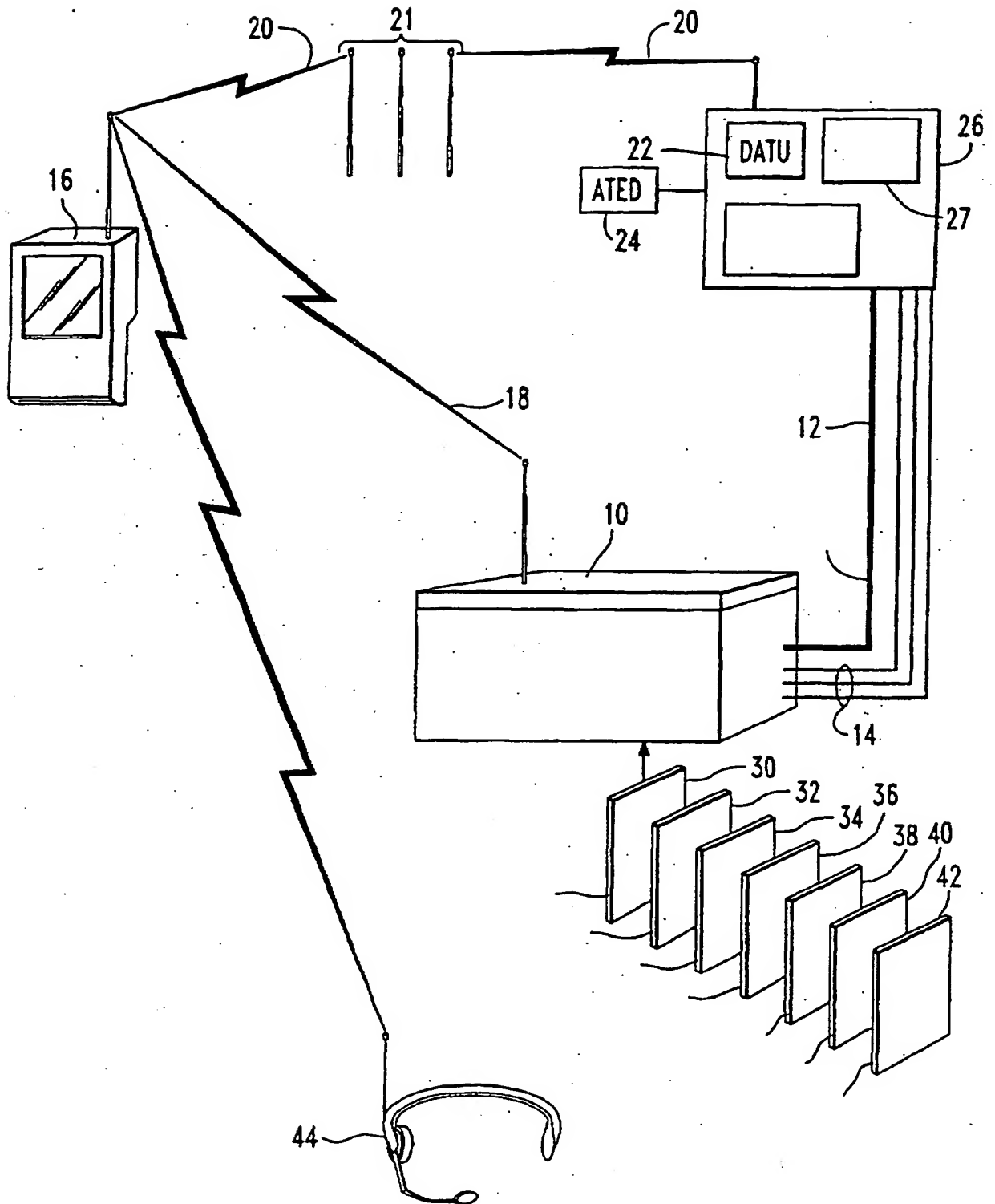


FIG. 1

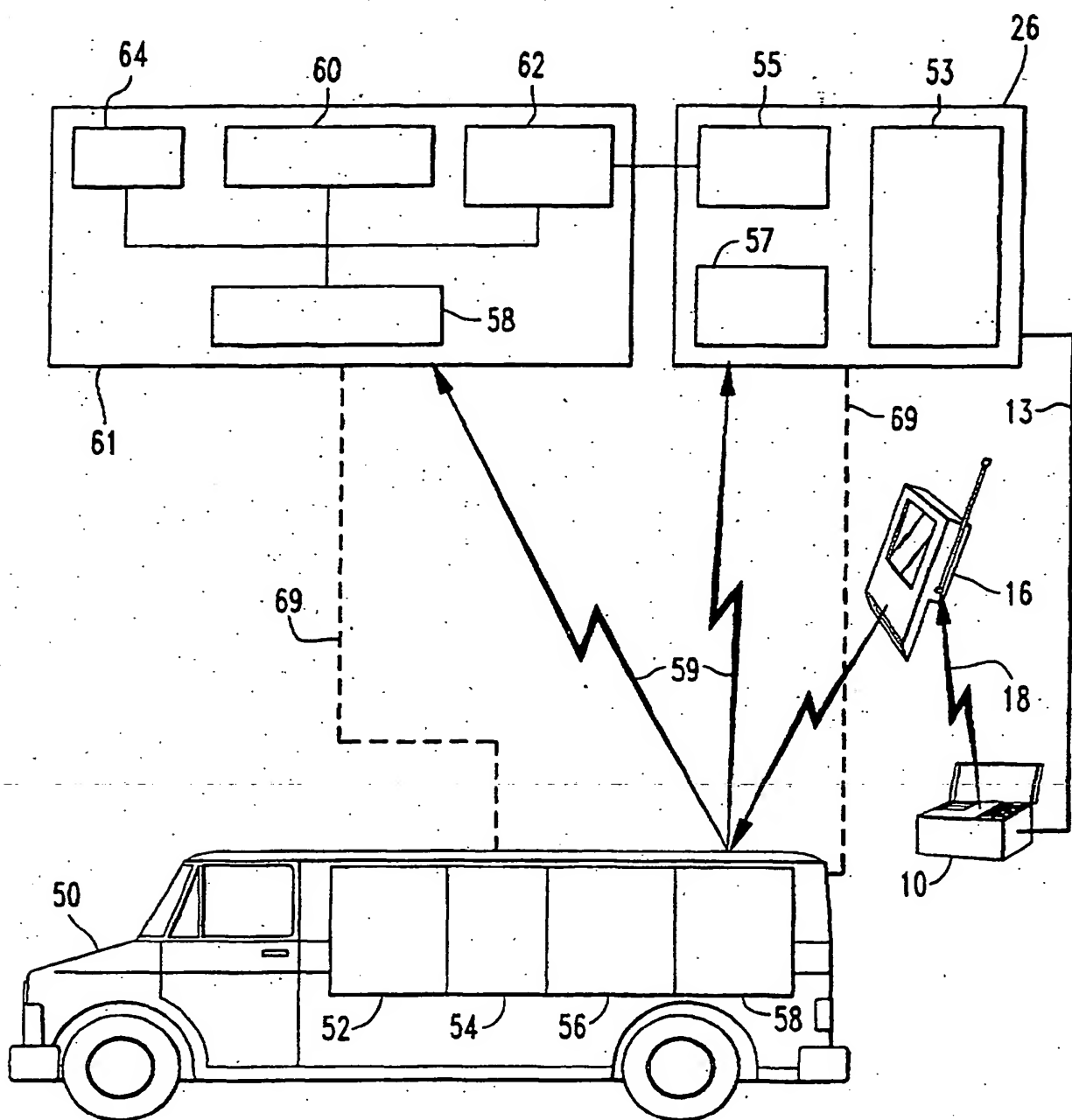


FIG. 2

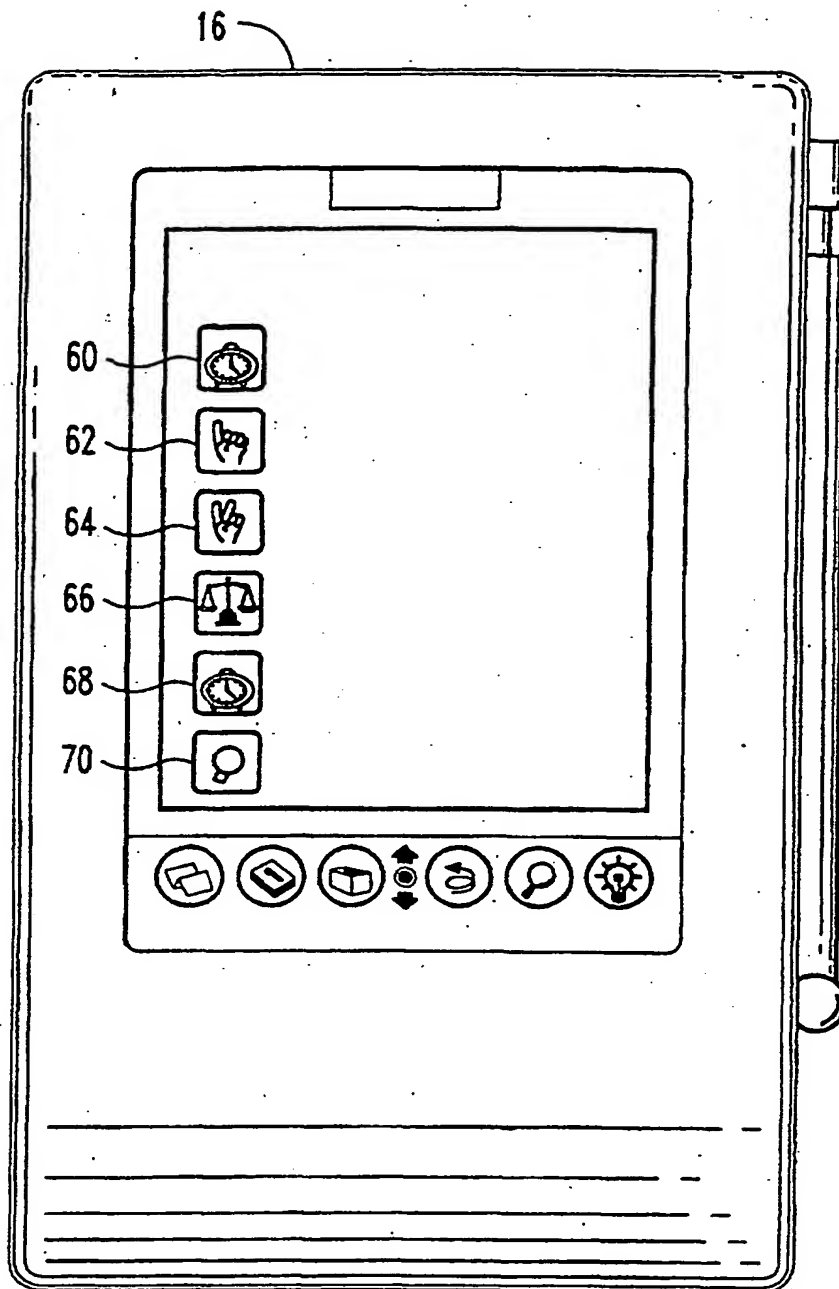


FIG. 3

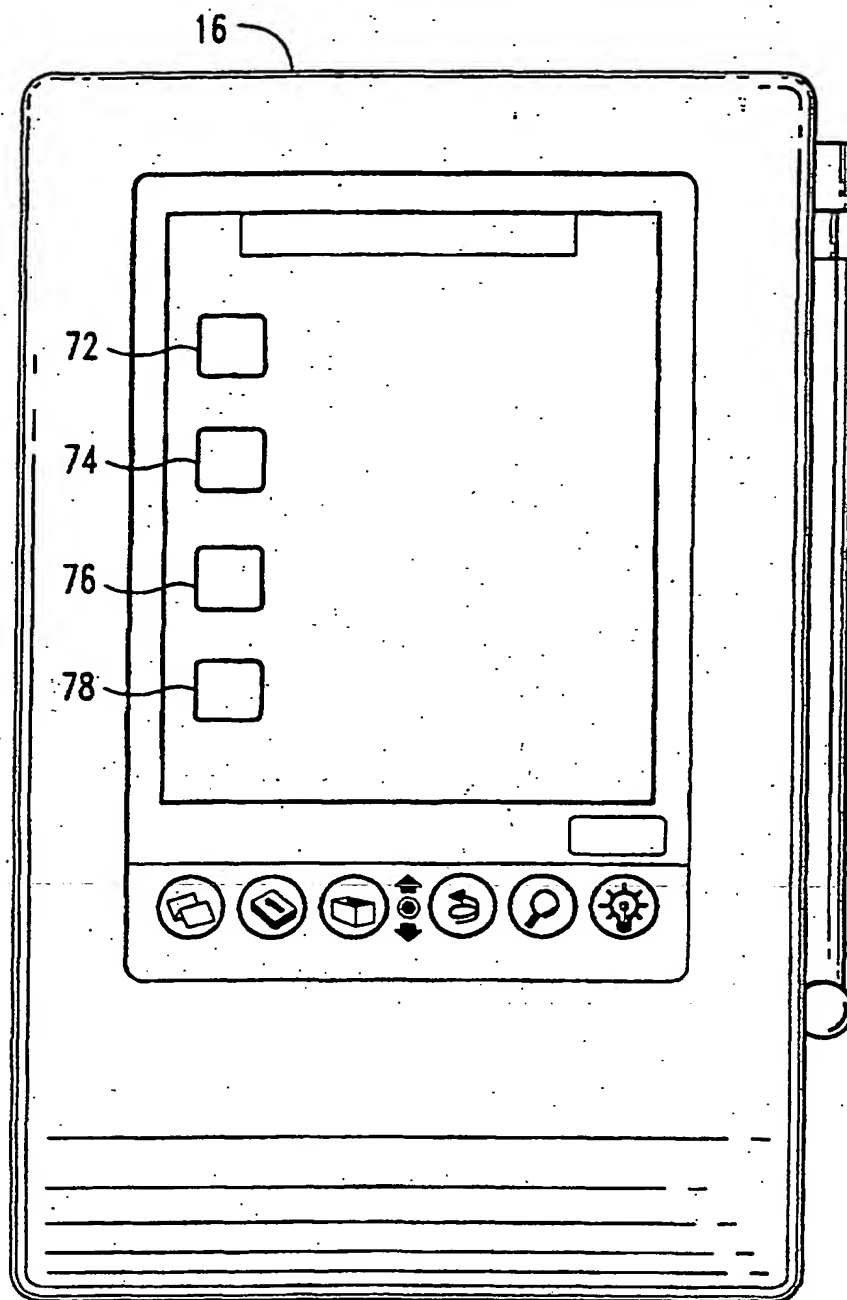


FIG. 4

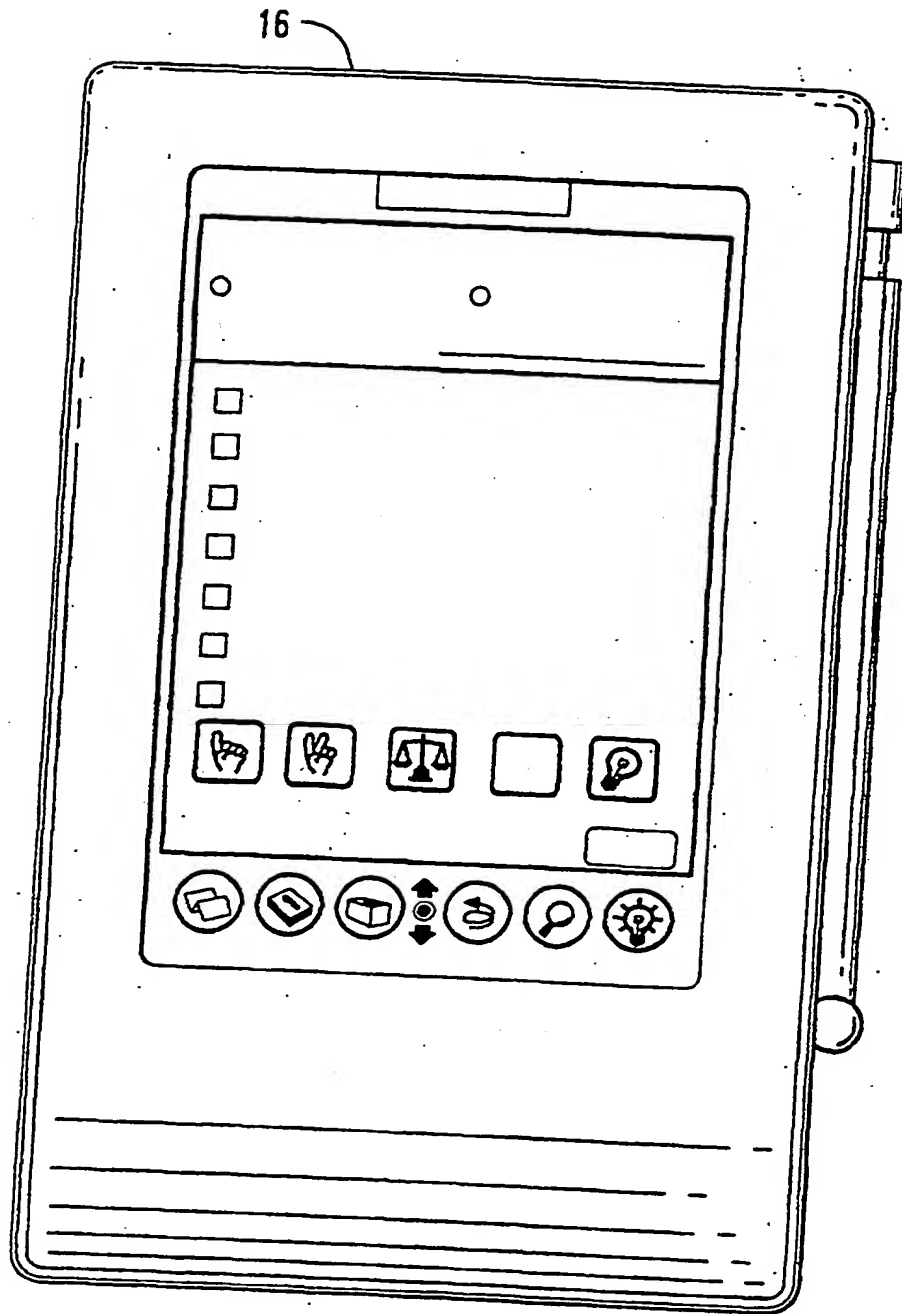


FIG. 5

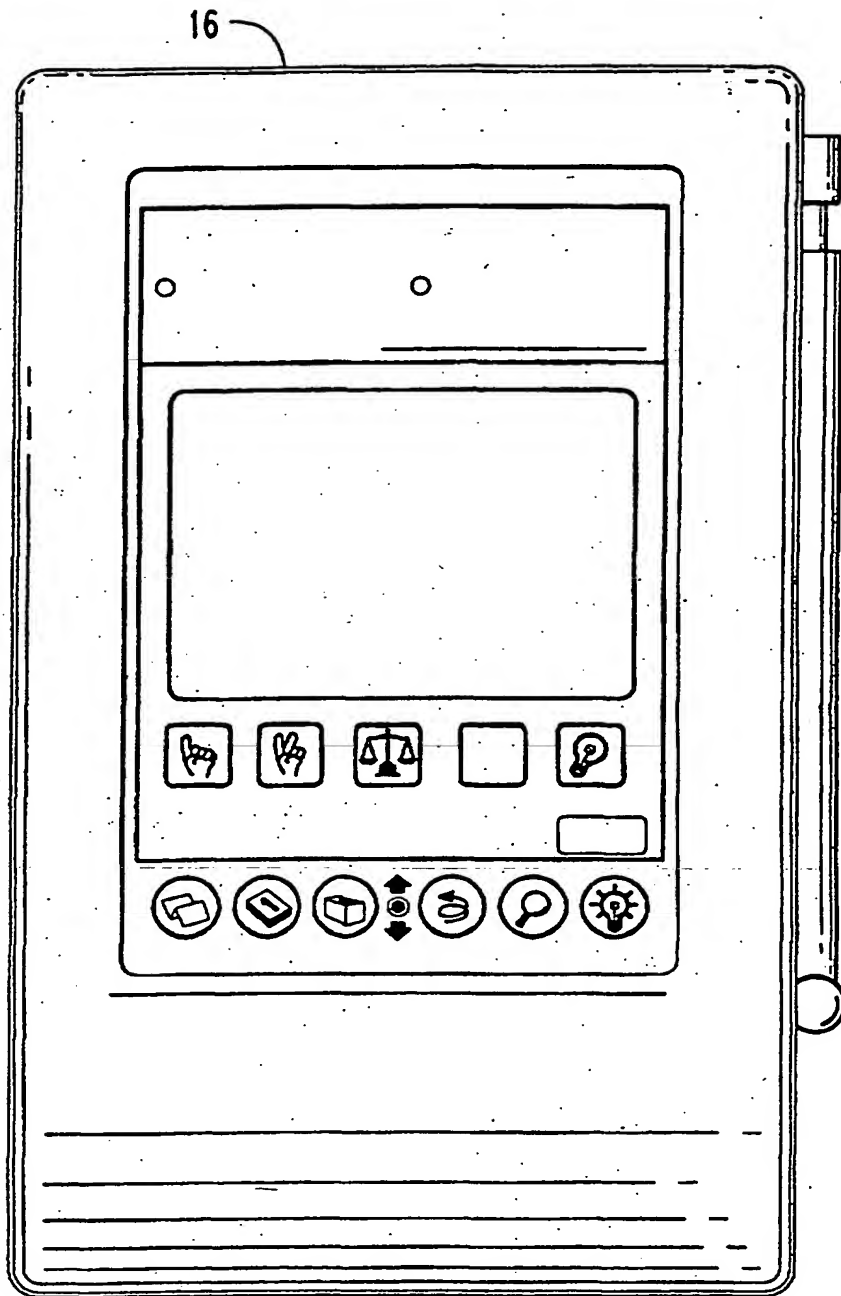


FIG. 6



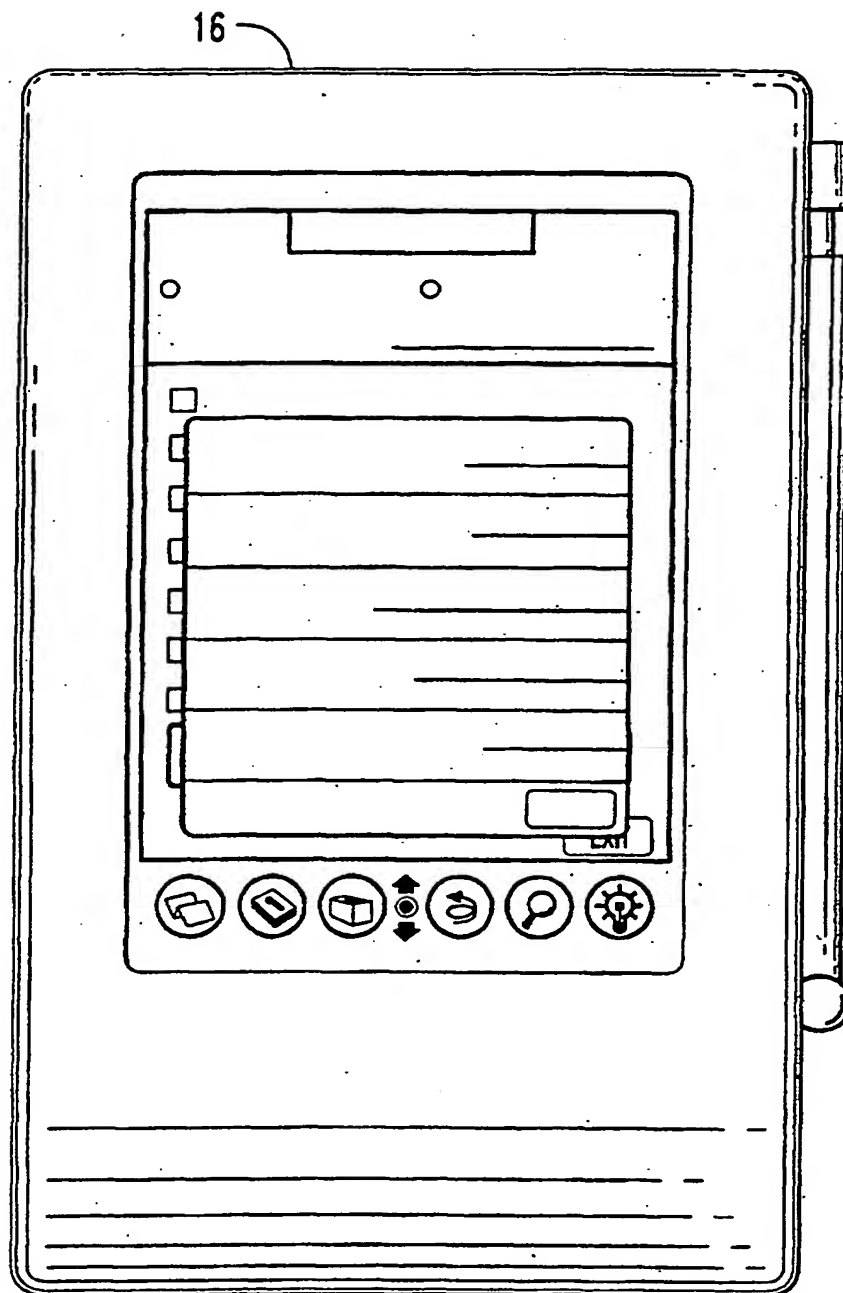


FIG. 7

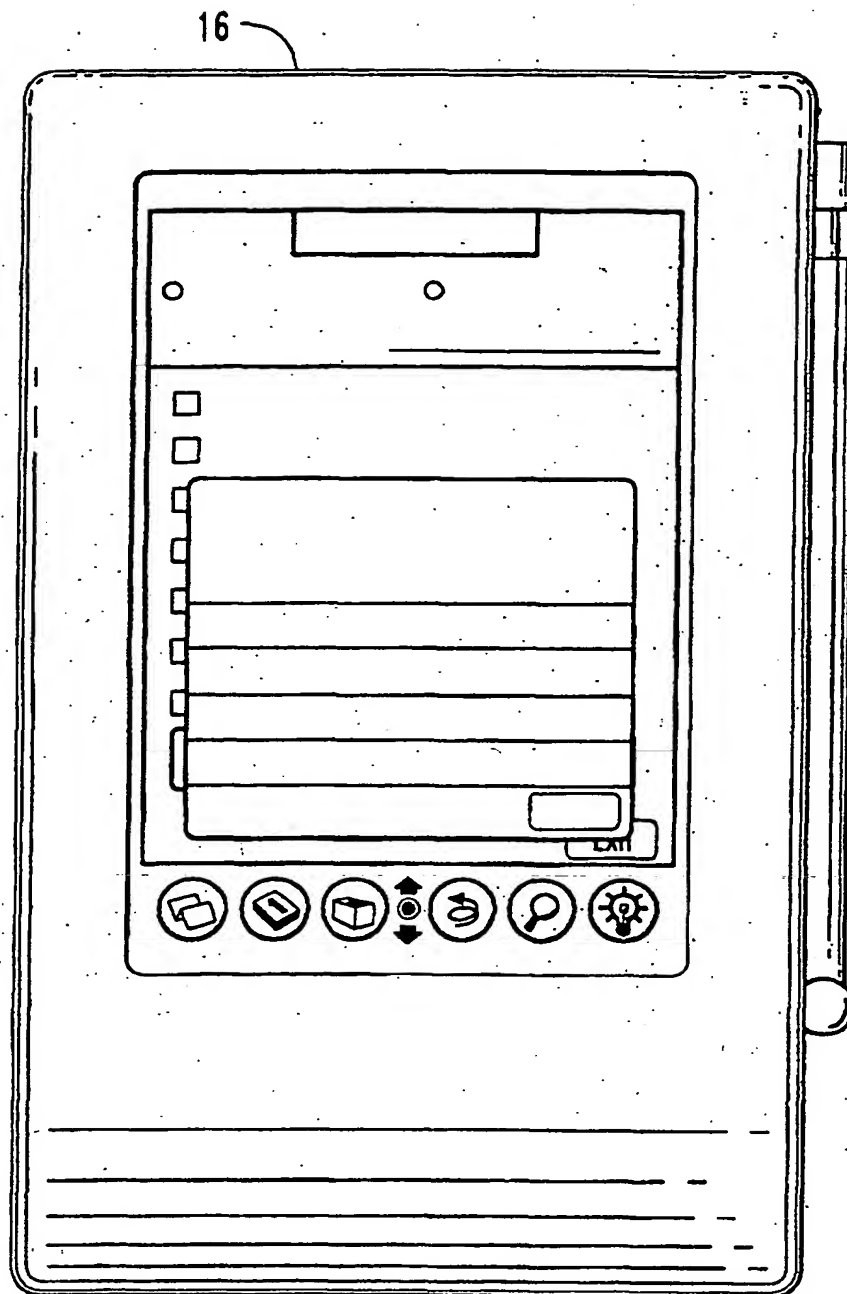


FIG. 8

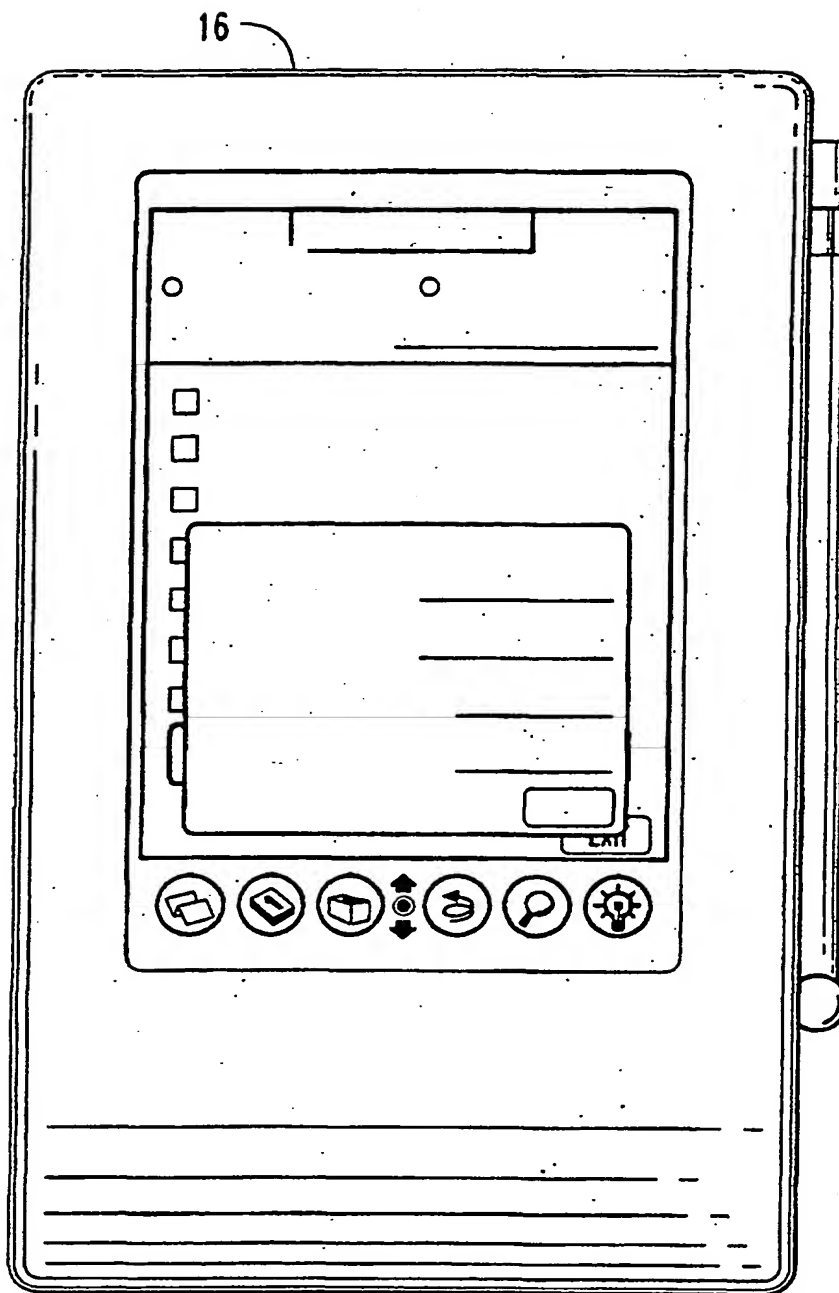


FIG. 9

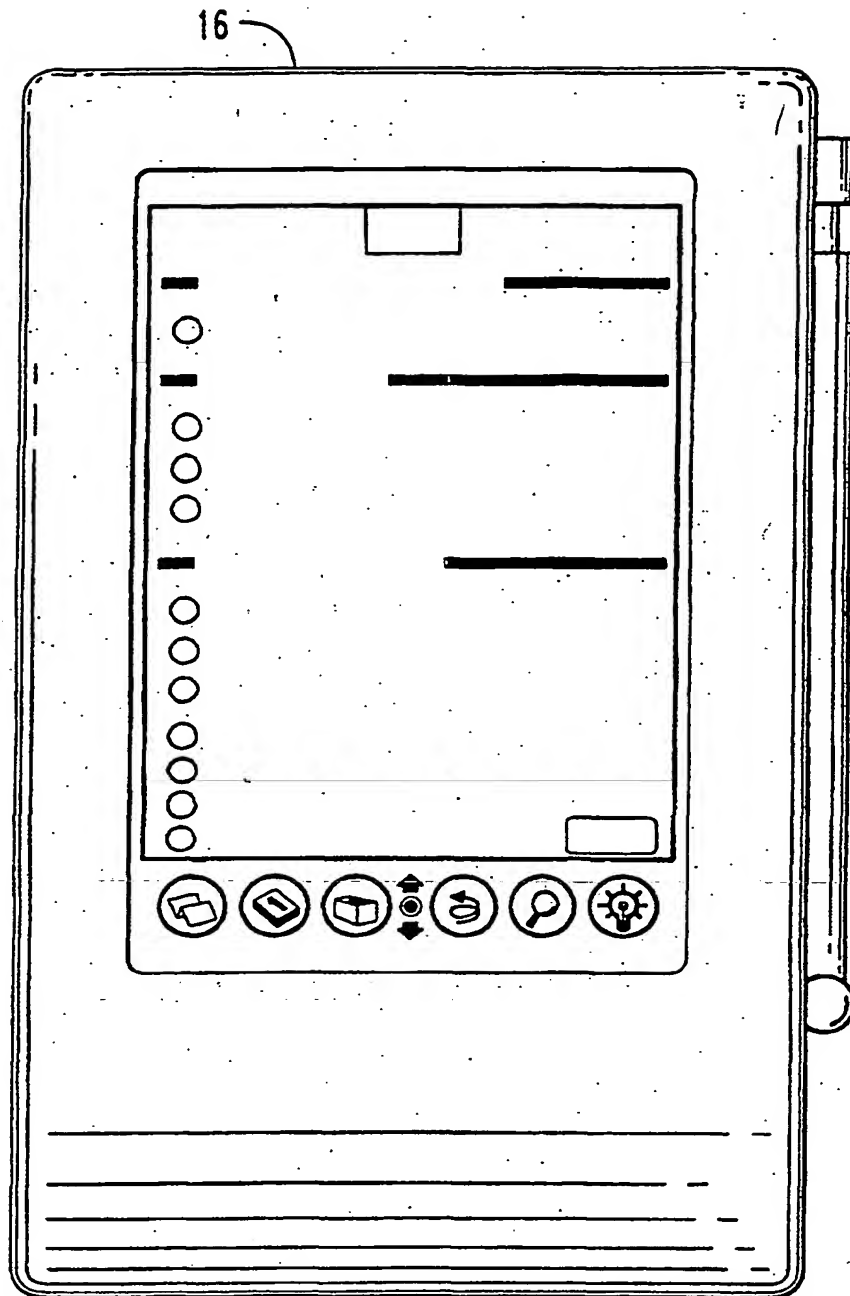


FIG. 10

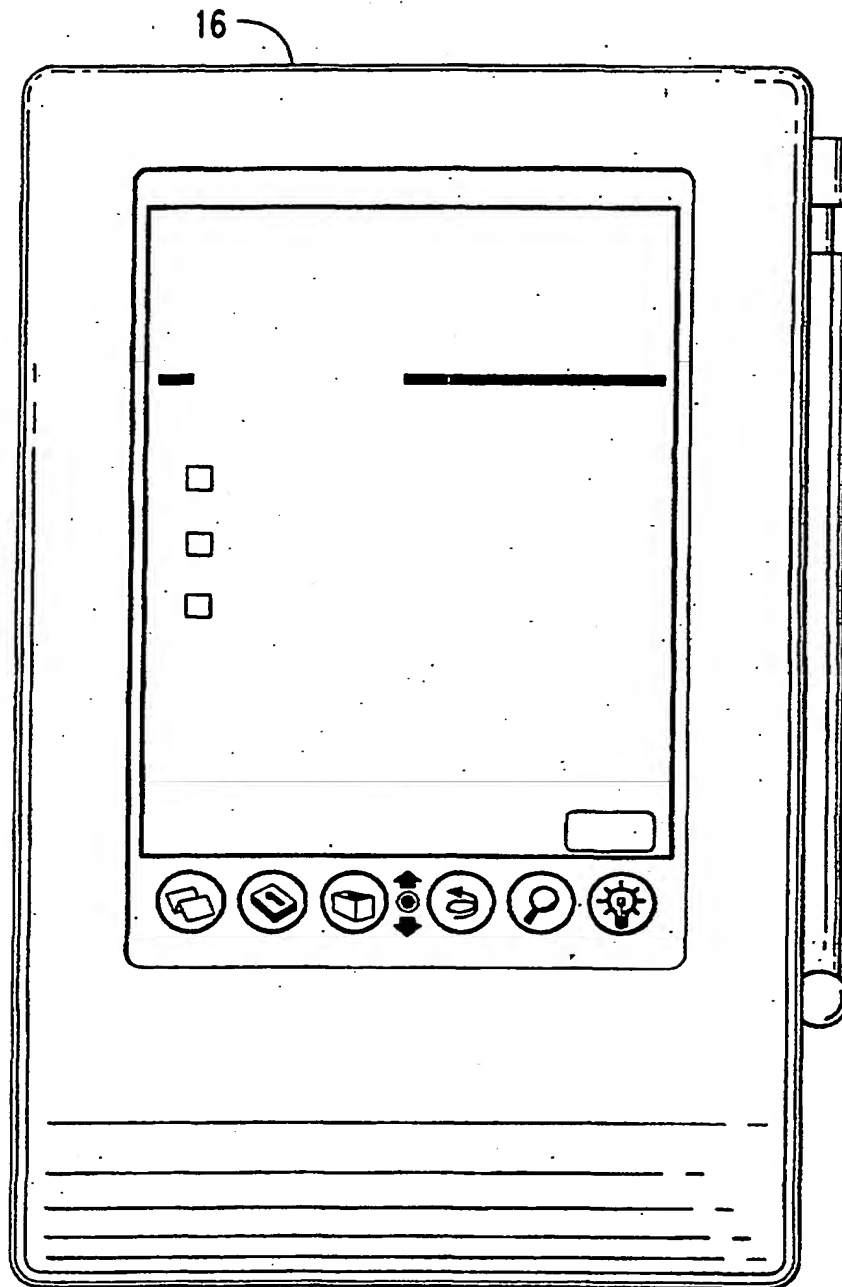


FIG. 11

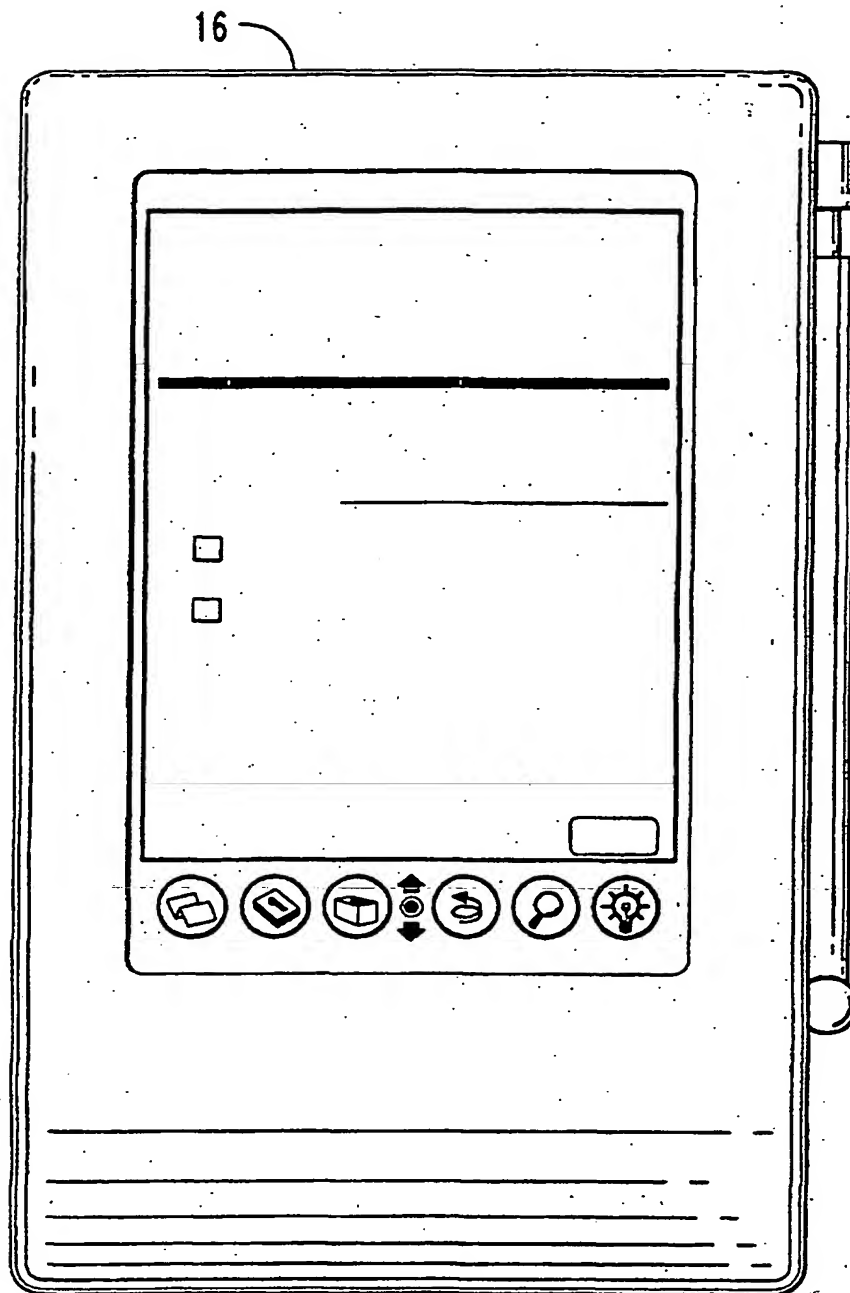


FIG. 12

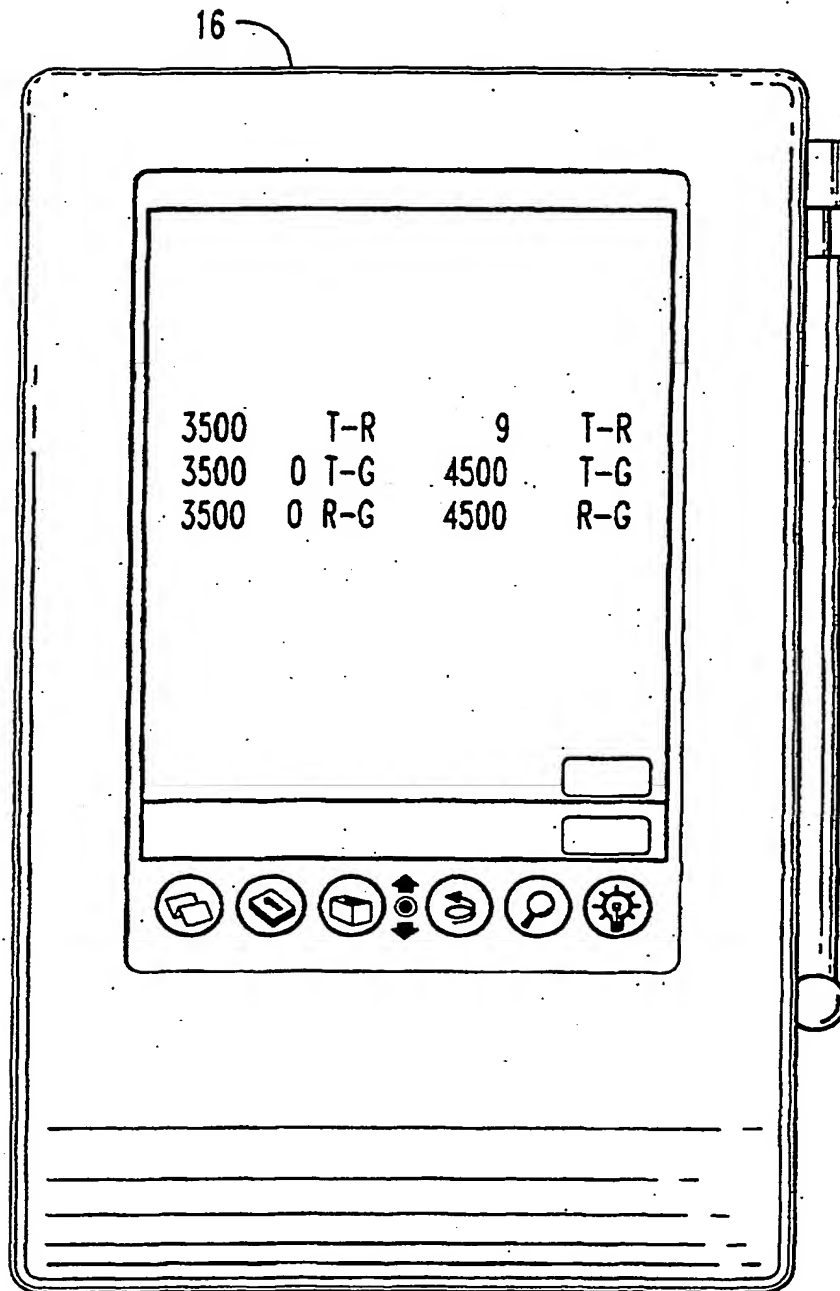


FIG. 13



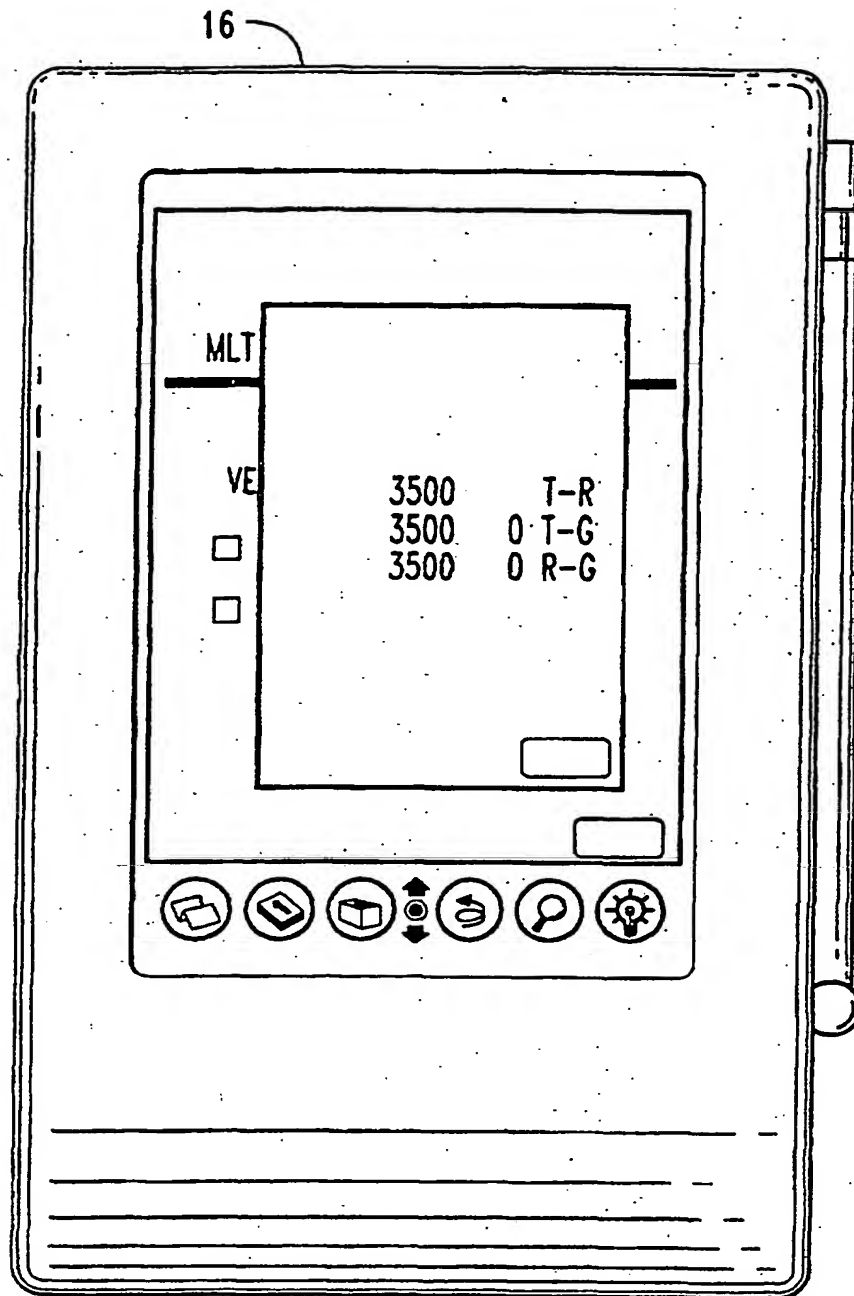


FIG. 14

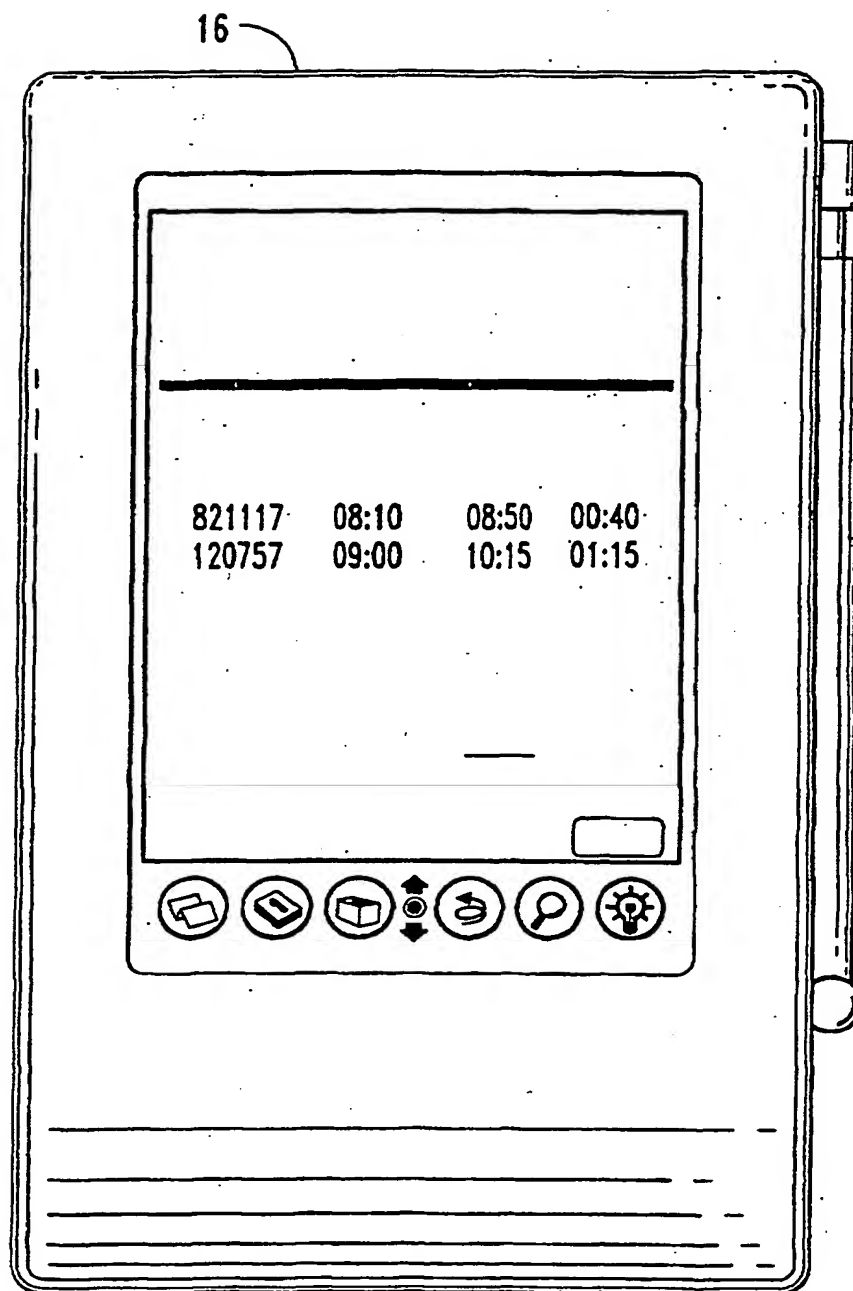


FIG. 15